

I. INTRODUCTION

Climate change is happening now. Rapidly melting ice caps, rising sea levels, extreme heat waves, droughts, fires, and floods are just a few of the secondary effects of climate change. These phenomena are having profound effects on our coast and are changing coastal management planning and decision-making at global, national, state, regional, local, and individual levels.

The California Coastal Commission staff prepared this guidance to provide a framework for addressing sea-level rise in Local Coastal Programs and Coastal Development Permits. The intended audience for this document includes the Commission, Commission staff, local governments, other public agencies, applicants, members of the public, and others who are interested in how to implement and comply with the California Coastal Act (Coastal Act) while taking steps to address sea-level rise.

Given current trends in greenhouse gas emissions, sea levels are expected to rise at an accelerating rate in the future, and scientists project an increase in California's sea level of up to 61 centimeters (24 inches) by 2050 and 167 centimeters (65.7 inches) by 2100, relative to year 2000 (NRC, 2012). Until mid-century, the most damaging events for the California coast will likely be dominated by large El Niño-driven storm events in combination with high tides and large waves. Eventually, sea level will rise enough that even small storms will cause significant damage, and large events will have unprecedented consequences (Caldwell et al., 2013).

Many of the potential impacts of sea-level rise directly overlap with the Coastal Commission's planning and regulatory responsibilities under the Coastal Act. Sea-level rise increases the risk of flooding, coastal erosion, and saltwater intrusion into freshwater supplies, which have the potential to threaten many of the resources that are integral to the California coast, including coastal development, coastal access and recreation, habitats (e.g. wetlands, coastal bluffs, dunes, and beaches), coastal agricultural lands, and cultural resources. Community character and scenic quality could be at risk as well. Impacts to coastal habitats are compounded by the fact that California already has lost 90% of its coastal wetlands, and erosion and flooding currently pose risks to many of the remaining coastal ecosystems (CA Natural Resources Agency, 2010). In addition, many possible responses to sea-level rise, such as construction of barriers or armoring, can have adverse impacts on coastal resources. Beaches, wetlands, and other habitat backed by fixed or permanent development will not be able to migrate inland as sea level rises, and will become permanently inundated over time, which presents serious concerns for future public access and habitat protection. The Coastal Act mandates the Commission to protect public access to the coast, open space, and coastal habitats, and other sensitive resources, as well as provide for priority visitor-serving and coastal-dependent or related development while minimizing the risks of coastal hazards. This guidance document has been created to help managers continue to achieve these goals in the face of sea-level rise.

California has approximately 21 million people currently living in coastal counties (as of 2010) (CA Department of Finance, 2013), and it supports a \$40 billion ocean economy (National Ocean Economics Program, 2010). Many aspects of the coastal economy, as well as California's broader economy, are at risk from sea-level rise, including coastal-related tourism, agriculture,

transfer of goods and services through ports and transportation networks, commercial fishing and aquaculture facilities, and beaches and recreation opportunities, including surfing. In addition, sea-level rise poses particular challenges for communities dependent on at-risk industries and for communities already suffering from economic hardship, which have limited capacity to adapt. These issues underscore the importance of taking proactive steps to prepare for sea-level rise, and to protect the coastal economy, California livelihoods, and coastal resources and the ecosystem services they provide.

RECENT EFFORTS TO PREPARE FOR SEA-LEVEL RISE

The State of California has long been a leader in preparing for sea-level rise, and in 2008, the Governor issued an Executive Order (S-13-08) directing state agencies to prepare guidance on sea-level rise and to address sea-level rise in any state projects located in vulnerable areas. In the past five years, state agencies have worked collaboratively to accomplish a variety of different actions related to sea-level rise adaptation, including developing a California Climate Adaptation Strategy (2009 and 2013 update in progress), passing a State Sea-Level Rise Resolution (2011), establishing State Sea-Level Rise Guidance (2013), and completing an Adaptation Planning Guide for local governments (2012). Ten state and federal agencies⁶ commissioned the National Academy of Sciences report (2012) to improve understanding of sea-level rise projections for California. Much of this work has been accomplished through the Coasts and Oceans Climate Action Team (CO-CAT), of which the Commission has been a member.

This guidance document is also part of a larger statewide strategy to respond to climate change. California is working on a number of important initiatives to both reduce the state's contribution to global warming through the emission of greenhouse gases, and to reduce the impacts of a changing climate to California. This guidance is being coordinated closely with many of these other initiatives, including the 2013 update to the 2009 California Adaptation Strategy (Safeguarding California Plan), 2013 update to the General Plan Guidelines, 2013 update to the California Office of Emergency Services' State Hazard Mitigation Plan and a number of other plans and programs that also affect land use development patterns and the reduction of long-term risk exposure to coastal hazards.⁷ It is important these various state efforts are closely coordinated and do not conflict, to assure an effective response to challenges such as sea-level rise.

Sea-level rise is not a new concern for the Commission. The Coastal Act policies on hazard avoidance and coastal resource protection provide the basis for the Commission to consider the impacts of sea-level rise. As a part of developing permit and Local Coastal Program recommendations for Commission consideration and pursuant to applicable Coastal Act policies,

⁶ The assessment of sea-level rise was commissioned by California Department of Water Resources, California Energy Commission, California Department of Transportation, California State Water Resources Control Board, California Ocean Protection Council, Oregon Watershed Enhancement Board, Washington Department of Ecology, National Oceanic and Atmospheric Administration (NOAA), U.S. Army Corps of Engineers (USACE), and U.S. Geological Survey (USGS).

⁷ See the Governor's Office of Planning and Research's webpage for a matrix of additional efforts. Available at: http://opr.ca.gov/s_publications.php

the Commission staff has long considered sea-level rise and erosion rates and other effects of a dynamic climate in its analysis and its recommendations to the Commission. The Commission coordinates this work with other state and federal agencies, local governments, academic institutions, non-profit organizations, citizen groups, permit applicants, property owners, and others.

Coastal Commission reports and briefing on sea-level rise: The Commission has documented its sea-level rise adaptation and climate change efforts in numerous papers and briefings, including:

- 1989 Report: [*Planning for Accelerated Sea-Level Rise along the California Coast*](#)
- 2001 Report: [*Overview of Sea Level Rise and Some Implications for Coastal California*](#)
- 2006 Briefing: [*Discussion Draft: Global Warming and the California Coastal Commission*](#)
- 2008 Briefing: [*A Summary of the Coastal Commission's Involvement in Climate Change and Global Warming Issues for a Briefing to the Coastal Commission*](#)
- 2008 White paper: [*Climate Change and Research Considerations*](#)
- 2010 Briefing: *A Summary of the Coastal Commission's Involvement in Sea Level Rise Issues for a Briefing to the Coastal Commission*

State agency policies and guidance on sea-level rise: As a result of the Executive Order S-13-08 and agency needs for guidance, many state agencies have developed sea-level rise policies and guidance documents. For example: The San Francisco Bay Conservation and Development Commission (BCDC) amended the *San Francisco Bay Plan* to update its policies regarding sea-level rise; the California State Coastal Conservancy (Conservancy) established climate change policies, application guidelines for sea-level rise, and climate ready principles; and the California Department of Transportation (CalTrans) developed guidance on incorporating sea-level rise into the planning and development of Project Initiation Documents, and is in the process of developing "hot spot" vulnerability assessment of transportation infrastructure at risk from sea-level rise. Other agencies including the California Department of Parks and Recreation and the California State Lands Commission are in the process of developing guidance. The California Department of Fish and Wildlife, Department of Boating and Waterways, Department of Water Resources are all actively addressing sea-level rise and have taken steps to conduct research on sea-level rise impacts, integrate sea-level rise into planning documents, and educate staff on climate change impacts (See [Appendix E](#) for a description of these efforts).

Other efforts: Sea-level rise planning efforts taking place at the local, regional, and state levels in California, as well as from other states and nations, helped inform this guidance. In addition, the Commission staff reviewed scientific publications on sea-level rise and climate change, adaptation guidebooks, and existing adaptation principles and best practices described in documents such as [*Indicators of Climate Change in California*](#) (Cal EPA, 2013), [*Adaptation Planning Guide*](#) (CA Natural Resources Agency, 2012), [*Adapting to Sea Level Rise: A Guide for California's Coastal Communities*](#) (Russell and Griggs, 2012), [*National Wildlife Federation Climate Change Adaptation Principles*](#) (2011), [*Ecosystem Adaptation to Climate Change in California: Nine Guiding Principles*](#) (Resources Legacy Fund, 2012), [*Climate Smart Principles by Point Blue*](#) (2013), and [*California State Coastal Conservancy Climate Ready Programmatic*](#)

[Priorities \(2013\)](#), and applied relevant information to the guidance where applicable and consistent with the Coastal Act.

2013-2014 Funding for LCP updates: The 2009 California Climate Adaptation Strategy identified amendments to Local Coastal Programs as a key strategy for addressing sea-level rise in California. Strategy 4e of the Coasts and Oceans Chapter states: "...all coastal jurisdictions, in coordination with the Coastal Commission, should begin to develop amended LCPs that include climate change impacts" (CA Natural Resources Agency, 2009, pg 77). However, there are significant funding constraints at both the Commission and local government levels that limit LCP amendments. To address this issue, the Ocean Protection Council has approved \$2.5 million in grant funds for local governments to update LCPs to address sea-level rise, and as of June 2013, the California Coastal Conservancy, Ocean Protection Council, and Coastal Commission are in the process of administering the new grant program.

In addition, Governor Brown and California Legislature approved an augmentation of \$4 million to the fiscal year 2013-2014 budget of the Coastal Commission (\$3 million for state operations and \$1 million for grants to local governments) for local governments and the Coastal Commission to prepare, update, amend, and review LCPs including with an emphasis on climate change issues. The Coastal Commission is working with the Administration to provide information to support long-term funding to address the critical need to update LCPs and include climate change adaptation.

PURPOSE AND SCOPE OF GUIDANCE DOCUMENT

This document contains recommendations for addressing sea-level rise in Local Coastal Programs (LCPs), Coastal Development Permits (CDPs), and other actions pursuant to the Coastal Act. Specifically, the document provides information on the current best available science on sea-level rise, techniques for assessing sea-level rise vulnerability, and strategies for reducing risks from sea-level rise. Its goal is to minimize risks to development and coastal resources from hazards and hazards response, avoid impacts to coastal resources on a dynamic coast, and maximize public access opportunities now and in the future, in accordance with the Coastal Act. There are many ways to evaluate and minimize the risks from sea-level rise, and Commission staff understands that different types of analyses and actions will be appropriate depending on the type of project or planning effort. As a result of the multiple purposes for this report, it is intended for a broad audience.

This guidance is not a regulatory document and does not directly govern the actions that the Commission or local governments may take under the Coastal Act. Any planning or regulatory action that the Commission or local governments may take is subject to the applicable requirements of the Coastal Act, the federal Coastal Zone Management Act, certified Local Coastal Programs, and other applicable laws and regulations as applied in the context of the evidence in the record for that action.

Finally, this guidance does not address how sea-level rise may involve private property rights and takings issues in specific cases. Accelerating sea-level rise may raise difficult issues with respect to what kinds and intensities of development are allowable or that must be allowed, in

specific areas threatened by sea-level rise in order to avoid a “taking” of property within the meaning of the United States and California constitutions. Coastal Act Section 30010 prohibits the Commission, ports, and local governments from exercising their coastal development permitting authority in a manner that will take or damage private property without just compensation. Evaluation of whether a particular regulatory action would constitute a taking involves consideration of a wide range of site- and project-specific factors. How to perform this evaluation is outside the scope of these Guidelines. Agencies implementing the Coastal Act should obtain legal advice regarding specific situations that raise takings concerns.

Sea-level rise is one of many climate change impacts that will affect coastal resources and development. The Coastal Act supports the consideration of other relevant climate change impacts in decision-making, and the Commission intends to provide guidance on a range of anticipated climate change impacts in the future.